EQ-1-C2-1.ST25.txt SEQUENCE LISTING

<110>	Dowling, Patricia W. Youngner, Julius S.
<120>	COLD-ADAPTED EQUINE INFLUENZA VIRUSES
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	10/065,133 2002-09-19
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	09/133,921 1998-08-13
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ctc at Leu Me	gaa tgg cta aag aca aga cca atc ctg tca cct ctg act aaa 195 Glu Trp Leu Lys Thr Arg Pro Ile Leu Ser Pro Leu Thr Lys 45 50 55
ggg at Gly Il	tta gga ttc gta ttc acg ctc acc gtg ccc agt gag cga gga 243 Leu Gly Phe Val Phe Thr Leu Thr Val Pro Ser Glu Arg Gly 60 65 70

Page 1

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Thr Leu Thr Val Pro Ser Glu Arg Gly Leu Gln Arg Arg Arg Phe Val 70 75 80

Gln Asn Ala Leu Ser Gly Asn Gly Asp Pro Asn Asn Met Asp Arg Ala 85 90 95

Val Lys Leu Tyr Arg Lys Leu-Lys Arg Glu Ile Thr Phe His Gly Ala 100 105 110

Lys Glu Val Ala Leu Ser Tyr Ser Thr Gly Ala Leu Ala Ser Cys Met 115 120 125

Gly Leu Ile Tyr Asn Arg Met Gly Thr Val Thr Thr Glu Val Ala Phe 130 135 140

Gly Leu Val Cys Ala Thr Cys Glu Gln Ile Ala Asp Ser Gln His Arg 145 150 155 160

Ser His Arg Gln Met Val Thr Thr Thr Asn Pro Leu Ile Arg His Glu 165 170 175

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Ala Gly Ser Ser Glu Gln Ala Ala Glu Ala Met Glu Val Ala Ser Lys 195 200 205

Ala Arg Gln Met Xaa Gln Ala Met Arg Thr Ile Gly Thr His Pro Ser 210 215 220

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Thr Leu Thr Val Pro Ser Glu Arg Gly Leu Gln Arg Arg Arg Phe Val 65 70 75 80	
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Gly Leu Ile Tyr Asn Arg Met Gly Thr Val Thr Thr Glu Val Ala Phe 130 135 140

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Page 21

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Leu Gln Asp Cys Lys Ile Ala Pro Leu Met Val Ala Tyr Met Leu Glu 195 200 205

Arg Glu Leu Val Arg Lys Thr Arg Phe Leu Pro Val Ala Gly Gly Thr 210 215 220

Ser Ser Val Tyr Ile Glu Val Leu His Leu Thr Gln Gly Thr Cys Trp 225 230 235 240

Glu Gln Met Tyr Thr Pro Gly Gly Glu Val Arg Asn Asp Asp Ile Asp 245 250 255

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360

420

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 100 105 110
- Lys Val His Lys Thr Tyr Phe Glu Lys Val Glu Arg Leu Lys His Gly 115 120 125
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- Ser Ser Val Tyr Ile Glu Val Leu His Leu Thr Gln Gly Thr Cys Trp 225 230 235 240
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- Gln Ser Leu Ile Ile Ala Ala Arg Asn Ile Val Arg Arg Ala Thr Val 260 265 270
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- Ser Ser Phe Ser Phe Gly Gly Phe Thr Phe Lys Arg Thr Ser Gly Ser 325 330 335

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Ser Val Lys Arg Glu Glu Glu Met Leu Thr Gly Asn Leu Gln Thr Leu 340 345 350

Lys Ile Arg Val His Glu Gly Tyr Glu Glu Phe Thr Met Val Gly Arg 355 360 365

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Ala Met Val Phe

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1196

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1233

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<212> PRT

<213> Equine influenza virus H3N8

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Met Ile Lys Ala Val Arg Gly Asp Leu Asn Phe Val Asn Arg Ala Asn 50 55 60

Gln Arg Leu Asn Pro Met His Gln Leu Leu Arg His Phe Gln Lys Asp 65 70 75 80

Ala Lys Val Leu Phe Gln Asn Trp Gly Ile Glu Pro Ile Asp Asn Val 85 90 95

Met Gly Met Ile Gly Ile Leu Pro Asp Met Thr Pro Ser Thr Glu Met 100 105 110

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Gln Gly Thr Glu Lys Leu Thr Ile Ile Tyr Ser Ser Ser Met Met Trp 165 170 175

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- Gln Met Arg Asp Val Leu Gly Thr Phe Asp Thr Ala Gln Ile Ile Lys 245 250 255
- Leu Leu Pro Phe Ala Ala Ala Pro Pro Glu Gln Ser Arg Met Gln Phe 260 265 270
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Gln Gly Thr Glu Lys Leu Thr Ile Ile Tyr Ser Ser Ser Met Met Trp 165 170 175

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Gln Met Arg Asp Val Leu Gly Thr Phe Asp Thr Ala Gln Ile Ile Lys 245 250 255

Leu Leu Pro Phe Ala Ala Ala Pro Pro Glu Gln Ser Arg Met Gln Phe 260 265 270

Ser Ser Leu Thr Val Asn Val Arg Gly Ser Gly Met Arg Ile Leu Val 275 280 285

Arg Gly Asn Ser Pro Val Phe Asn Tyr Asn Lys Ala Thr Lys Arg Leu 290 295 300

Thr Val Leu Gly Lys Asp Ala Gly Ala Leu Thr Glu Asp Pro Asp Glu 305 310 315

Gly Thr Ala Gly Val Glu Ser Ala Val Leu Arg Gly Phe Leu Ile Leu 325 330 335

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Pro 465	Asp	Met	Thr	Pro	Ser 470	Thr	Glu	Met	Ser	Leu 475		Gly	Val	Arg	Val 480
Ser	Lys	Met	Gly	Val 485	Asp	Glu	Tyr	Ser	Ser 490		Glu	Arg	Val	Val 495	Val
Ser	Ile	Asp	Arg 500		. Leu	Arg	Val	Arg		Gln	Arg	Gly	Asn 510	Ile	Leu
Leu	Ser	Pro 515		Glu	. Val	Ser	Glu 520		Gln	Gly	Thr	Glu 525	Lys	Leu	Thr
Ile	: I1∈ 530		: Ser	Ser	Ser	Met 535		. Trp	Glu	ı Ile	Asn 540		Pro	Glu	Ser

Page 57

Val	Leu	Val	Asn	Thr	Tyr	Gln	Trp	Ile	Ile	Arg	Asn	Trp	Glu	Ile	Val
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Lys Ile Gln Trp Ser Gln Asp Pro Thr Met Leu Tyr Asn Lys Ile Glu 565 570 575

Phe Glu Pro Phe Gln Ser Leu Val Pro Arg Ala Thr Arg Ser Gln Tyr 580 585 590

Ser Gly Phe Val Arg Thr Leu Phe Gln Gln Met Arg Asp Val Leu Gly 595 600 605

Thr Phe Asp Thr Ala Gln Ile Ile Lys Leu Leu Pro Phe Ala Ala Ala 610 615 620

Pro Pro Glu Gln Ser Arg Met Gln Phe Ser Ser Leu Thr Val Asn Val 625 630 635 640

Arg Gly Ser Gly Met Arg Ile Leu Val Arg Gly Asn Ser Pro Val Phe 645 650 655

Asn Tyr Asn Lys Ala Thr Lys Arg Leu Thr Val Leu Gly Lys Asp Ala 660 665 670

Gly Ala Leu Thr Glu Asp Pro Asp Glu Gly Thr Ala Gly Val Glu Ser 675 680 685

Ala Val Leu Arg Gly Phe Leu Ile Leu Gly Lys Glu Asn Lys Arg Tyr 690 695 700

Gly Pro Ala Leu Ser Ile Asn Glu Leu Ser Lys Leu Ala Lys Gly Glu 705 710 715 720

Lys Ala Asn Val Leu Ile Gly Gln Gly Asp Val Val Leu Val Met Lys
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1680

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30 35 40	
	197
tcc cta aaa gga aga ggt agc act ctt ggt ctg gac atc gaa aca gcc Ser Leu Lys Gly Arg Gly Ser Thr Leu Gly Leu Asp Ile Glu Thr Ala	197 245

								2-1-0									
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gca Ala	atc Ile	atg Met	gat Asp 125	aag Lys	aac Asn	atc Ile	ata Ile	ctt Leu 130	aaa Lys	gca Ala	aac Asn	ttt Phe	agt Ser 135	gtg Val	att Ile	43	7
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gct Ala	tgg Trp	aga Arg	agc Ser 205	Ser	cat His	gag Glu	aat Asn	ggg Gly 210	Arg	cct Pro	tca Ser	ttc Phe	cct Pro 215	cca Pro	aag Lys	67	7
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Thr Leu Gly Leu Asp Ile Glu Thr Ala Thr Arg Ala Gly Lys Gln Ile 55

Val Glu Gln Ile Leu Glu Glu Glu Ser Asp Glu Ala Leu Lys Met Thr

Ile Ala Ser Val Pro Ala Ser Arg Tyr Leu Thr Asp Met Thr Leu Asp · 85 90

Glu Met Ser Arg Asp Trp Phe Met Leu Met Pro Lys Gln Lys Val Thr

Gly Ser Leu Cys Ile Arg Met Asp Gln Ala Ile Met Asp Lys Asn Ile 115

Ile Leu Lys Ala Asn Phe Ser Val Ile Phe Glu Arg Leu Glu Thr Leu 135

Ile Leu Leu Arg Ala Phe Thr Glu Glu Gly Ala Val Val Gly Glu Ile 150 155

Ser Pro Leu Pro Ser Leu Pro Gly His Thr Asn Glu Asp Val Lys Asn 170

Ala Ile Gly Val Leu Ile Gly Gly Leu Lys Trp Asn Asp Asn Thr Val 185

Arg Ile Ser Glu Thr Leu Gln Arg Phe Ala Trp Arg Ser Ser His Glu 200

Asn Gly Arg Pro Ser Phe Pro Pro Lys Gln Lys Arg Lys Met Glu Arg 215

Thr Ile Glu Pro Glu Val 230

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_		-	. :	22422424	tananataa	aattaaaata	540
	tcaccattgc	cttctcttcc	aggacatact	aatgaggatg	ccaaaaacyc	aaccggggcc	240
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	ttagattaga	aaaacaatca	tgagaatggg	agacetteat	tccctccaaa	gcagaaacga	660
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gcc tto Ala Phe	c acc o	Glu G	aa gg lu Gi 0	ga gca ly Ala	gtc Val	gtt Val	ggc Gly 25	gaa Glu	att Ile	tca Ser	cca Pro	ttg Leu 30	cct Pro	95
tct ct Ser Le	ı Pro (	gga c Gly H 35	at ac (is T)	ct aat nr Asn	gag Glu	gat Asp 40	gtc Val	aaa Lys	aat Asn	gca Ala	att Ile 45	Gly ggg	gtc Val	143
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tca tt Ser Ph	c cct de Pro	cca a Pro I	ag c ys G 8	ln Lys	cga Arg	aaa Lys	atg Met	gag Glu 90	aga Arg	aca Thr	att Ile	gag Glu	cca Pro 95	287
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Phe	Thr	Glu	Glu	Gly	Ala	Val	Val	Gly	Glu	Ile	Ser	Pro	Leu	Pro	Ser
			20	-				25					30		

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Ile Gly Gly Leu Lys Trp Asn Asp Asn Thr Val Arg Ile Ser Glu Thr 50 55 60

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act cgt gca gga aag Thr Arg Ala Gly Lys 60	cag ata gtg gag Gln Ile Val Glu 65	cag att ctg gaa gag Gln Ile Leu Glu Glu 70	gaa tca 245 Glu Ser
gat gag gca ctt aaa Asp Glu Ala Leu Lys 75	atg acc att gcc Met Thr Ile Ala 80	tct gtt cct gct tca Ser Val Pro Ala Ser 85	cgc tac 293 Arg Tyr
tta act gac atg act Leu Thr Asp Met Thr 90	ctt gat gag atg Leu Asp Glu Met 95	tca aga gac tgg ttc Ser Arg Asp Trp Phe 100	atg ctc 341 Met Leu 105
atg ccc aag cag aaa Met Pro Lys Gln Lys 110	S Val Thr Gly Ser	cta tgt ata aga atg Leu Cys Ile Arg Met 115	gac cag 389 Asp Gln 120
gca atc atg gat aag Ala Ile Met Asp Lys 125	g aac atc ata ctt s Asn Ile Ile Leu 130	aaa gca aac ttt agt Lys Ala Asn Phe Ser 135	gtg att 437 Val Ile
ttc gaa agg ctg gag Phe Glu Arg Leu Glu 140	g aca cta ata cta 1 Thr Leu Ile Leu 145	ctt aga gcc ttc acc Leu Arg Ala Phe Thr 150	gaa gaa 485 Glu Glu
gga gca gtc gtt ggc Gly Ala Val Val Gly 155	gaa att tca cca Glu Ile Ser Pro 160	ttg cct tct ctt cca Leu Pro Ser Leu Pro 165	gga cat 533 Gly His
act aat gag gat gto Thr Asn Glu Asp Val 170	c aaa aat gca att l Lys Asn Ala Ile 175	ggg gtc ctc atc gga Gly Val Leu Ile Gly 180	gga ctt 581 Gly Leu 185
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gct tgg aga agc agt Ala Trp Arg Ser Ser 205	t cat gag aat ggg r His Glu Asn Gly 210	aga cct tca ttc cct Arg Pro Ser Phe Pro 215	cca aag 677 Pro Lys
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His	Val	Arg	Lys 20	Arg	Phe	Ala	Asp	Gl: 25
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Thr	Leu 50	Gly	Leu	Asp	Ile	Glu 55	Thr	Al
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	•							

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Ala Ile Gly Val Leu Ile Gly Gly Leu Lys Trp Asn Asp Asn Thr Val 185 180 Arg Ile Ser Glu Thr Leu Gln Arg Phe Ala Trp Arg Ser Ser His Glu 205 200 Page 67

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Page 69

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<213> Equine influenza virus H3N8

<400> 63

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Gly Thr Gly Thr Gly Tyr Thr Met Asp Thr Val Asn Arg Thr His Gln 35 40 45

Tyr Ser Glu Lys Gly Lys Trp Thr Thr Asn Thr Glu Ile Gly Ala Pro 50 55 60

Gln Leu Asn Pro Ile Asp Gly Pro Leu Pro Glu Asp Asn Glu Pro Ser 65 70 75 80

Gly Tyr Ala Gln Thr Asp Cys Val Leu Glu Ala Met Ala Phe Leu Glu 85 90 95

Glu Ser His Pro Gly Ile Phe Glu Asn Ser Cys Leu Glu Thr Met Glu 100 105 110

Val Val Gln Gln Thr Arg Val Asp Lys Leu Thr Gln Gly Arg Gln Thr 115 120 125

Tyr Asp Trp Thr Leu Asn Arg Asn Gln Pro Ala Ala Thr Ala Leu Ala 130 135 140

Asn Thr Ile Glu Val Phe Arg Ser Asn Asp Leu Thr Ser Ser Glu Ser 145 150 155 160

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Lys Gly Tyr Met Phe Glu Ser Lys Ser Met Lys Leu Arg Thr Gln Ile 355 360 365

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Page 73

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<213> Equine influenza virus H3N8

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15

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# Asn Thr Met Thr Lys Asp Ala Glu Arg Gly Lys Leu Lys Arg Arg Ala 225 230 235 240

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### Thr Leu Ala Arg Arg Ile Cys Glu Lys Leu Glu Gln Ser Gly Leu Pro 260 265 270

## Val Gly Gly Asn Glu Lys Lys Ala Lys Leu Ala Asn Val Val Arg Lys 275 280 285

# Met Met Thr Asn Ser Gln Asp Thr Glu Leu Ser Phe Thr Ile Thr Gly 290 295 300

# Leu Ser Ile Ala Pro Ile Met Phe Ser Asn Lys Met Ala Arg Leu Gly 340 345 350

Lys Gly Tyr Met Phe Glu Ser Lys Ser Met Lys Leu Arg Thr Gln Ile 355 360 365

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<211> 1185

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<213> Equine influenza virus H3N8

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agc atg agg aga aat tat ttt act get get gag gtt tcc cat tgt aga gca star arg and and sharp the through the star of	Gln	agt Ser	gag Glu	ttc Phe	aac Asn	Lys	gct Ala	tgt Cys	gag Glu	ctg Leu	Thr	gat Asp	tca Ser	agc Ser	tgg Trp	Ile	287
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Cys Leu Leu Gln Ser Leu Gln Gln Ile Glu Ser Met Ile Glu Ala Glu 260 265 270	Asn	Gly	acc Thr	tct Ser	aaa Lys	Ile	Lys	atg Met	aaa Lys	cgg Arg	Gly	Met	gaa Glu	atg Met	aga Arg	Arg	767
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Glu Tyr Ile Met Lys Gly Val Tyr Ile Asn Thr Ala Leu Leu Asn Ala 130 135 140

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Ile Lys Gly Arg Ser His Leu Arg Asn Asp Thr Asp Val Val Asn Phe 180 185 190

Val Ser Met Glu Phe Ser Leu Thr Asp Pro Arg Phe Glu Pro His Lys 195 200 205

Trp Glu Lys Tyr Cys Val Leu Glu Ile Gly Asp Met Leu Leu Arg Thr 210 215 220

Ala Val Gly Gln Val Ser Arg Pro Met Phe Leu Tyr Val Arg Thr Asn 225 230 235 240

Gly Thr Ser Lys Ile Lys Met Lys Arg Gly Met Glu Met Arg Arg Cys 245 250 255

Leu Leu Gln Ser Leu Gln Gln Ile Glu Ser Met Ile Glu Ala Glu Ser 260 265 270

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Glu Thr Trp Pro Ile Gly Glu Ser Pro Lys Gly Val Glu Glu Gly Ser 290 295 300

Ile Gly Lys Val Cys Arg Thr Leu Leu Ala Lys Ser Val Phe Asn Ser 305 310 315

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Ala Pro Glu Lys Val Asp Phe Glu Asp Cys Lys Asp Ile Asn Asp Leu 50 55 60

Lys Gln Tyr Asp Ser Asp Glu Pro Glu Thr Arg Ser Leu Ala Ser Trp 65 70 75 80

Ile Gln Ser Glu Phe Asn Lys Ala Cys Glu Leu Thr Asp Ser Ser Trp 85 90 95

Ile Glu Leu Asp Glu Ile Gly Glu Asp Ile Ala Pro Ile Glu Tyr Ile 100 105 110

Ala Ser Met Arg Arg Asn Tyr Phe Thr Ala Glu Val Ser His Cys Arg 115 120 125

Ala Thr Glu Tyr Ile Met Lys Gly Val Tyr Ile Asn Thr Ala Leu Leu 130 135 140

Asn Ala Ser Cys Ala Ala Met Asp Glu Phe Gln Leu Ile Pro Met Ile 145 150 155 160

Ser Lys Cys Arg Thr Lys Glu Gly Arg Arg Lys Thr Asn Leu Tyr Gly 165 170 175

Phe Ile Ile Lys Gly Arg Ser His Leu Arg Asn Asp Thr Asp Val Val 180 185 190

Asn Phe Val Ser Met Glu Phe Ser Leu Thr Asp Pro Arg Phe Glu Pro 195 200 205

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Thr	Asn	Gly	Thr	Ser 245	Lys	Ile	Lys	Met	Lys 250	Trp	Gly	Met	Glu	Met 255	Arg	
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Ile	Asn 370	_	Pro	Trp	Val	Leu 375	Leu	Asn	Ala	Ser	Trp 380	Phe	Asn	Ser	Phe	
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caa tca tcc gat gat ttt gct ttg ata gtg aat gcg cct aat cat gaa Gln Ser Ser Asp Asp Phe Ala Leu Ile Val Asn Ala Pro Asn His Glu 85 90 95	8 8
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gac atg agc att gga atg aca gtt atc aaa aac aac atg ata aat aat Asp Met Ser Ile Gly Met Thr Val Ile Lys Asn Asn Met Ile Asn Asn 165 170 175	28
gat ctc ggt ccc gcc acg gca caa atg gca ctc caa ctc ttc att aag 57 Asp Leu Gly Pro Ala Thr Ala Gln Met Ala Leu Gln Leu Phe Ile Lys Page 93	76

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aga Arg	aac Asn	cta Leu	cac His	atc Ile 245	ccg Pro	gaa Glu	gtc Val	tgt Cys	ttg Leu 250	aaa Lys	tgg Trp	gag Glu	ctg Leu	atg Met 255	gat Asp		768
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Gly Met Phe Asn Met Leu Ser Thr Val Leu Gly Val Ser Ile Leu Asn 50 60

Leu Gly Gln Arg Lys Tyr Thr Lys Thr Thr Tyr Trp Trp Asp Gly Leu 65 70 75 80

Gln Ser Ser Asp Asp Phe Ala Leu Ile Val Asn Ala Pro Asn His Glu 85 90 95

Gly Ile Gln Ala Gly Val Asp Arg Phe Tyr Arg Thr Cys Lys Leu Val 100 105 110

Gly Ile Asn Met Ser Lys Lys Lys Ser Tyr Ile Asn Arg Thr Gly Thr 115 120 125

Phe Glu Phe Thr Ser Phe Phe Tyr Arg Tyr Gly Phe Val Ala Asn Phe 130 135 140

Ser Met Glu Leu Pro Ser Phe Gly Val Ser Gly Ile Asn Glu Ser Ala 145 150 155 160

Asp Met Ser Ile Gly Met Thr Val Ile Lys Asn Asn Met Ile Asn Asn 165 170 175

Asp Leu Gly Pro Ala Thr Ala Gln Met Ala Leu Gln Leu Phe Ile Lys 180 185 190

Asp Tyr Arg Tyr Thr Tyr Arg Cys His Arg Gly Asp Thr Gln Ile Gln
195 200 205

Thr Arg Arg Ser Phe Glu Leu Lys Lys Leu Trp Glu Gln Thr Arg Ser 210 220

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Arg _.	Asn	Leu	His	Ile 245	Pro	Glu	Val	Cys	Leu 250	Lys	Trp	Glu	Leu	Met 255		
Glu	Asp	Tyr	Lys 260	Gly	Arg	Leu	Cys	Asn 265	Pro	Leu	Asn	Pro	Phe 270	Val	Ser	
His	Lys	Glu 275	Ile	Glu	Ser	Val	Asn 280	Ser	Ala	Val	Val	Met 285	Pro	Ala	His	
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	145											
ata cga cca ctt ctg gtc gat ggg act gct tca ctg agt cct ggc atg Ile Arg Pro Leu Leu Val Asp Gly Thr Ala Ser Leu Ser Pro Gly Met 35 40 45	7.4.7											

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ggt Gly	ctg Leu 80	caa Gln	tca Ser	tcc Ser	gat Asp	gat Asp 85	ttt Phe	gct Ala	ttg Leu	ata Ile	gtg Val 90	aat Asn	gcg Ala	cct Pro	aat Asn	289
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ctg Leu	gtc Val	Gly ggg	atc Ile	aac Asn 115	atg Met	agc Ser	aaa Lys	aag Lys	aag Lys 120	tcc Ser	tac Tyr	ata Ile	aat Asn	aga Arg 125	acc Thr	385
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Asp Tyr Arg Tyr Thr Tyr Arg Cys His Arg Gly Asp Thr Gln Ile Gln
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Lys Thr Gly Leu Leu Val Ser Asp Gly Gly Pro Asn Leu Tyr Asn Ile 225 230 235 240

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Gly Pro Ala Lys Ser Met Glu Tyr Asp Ala Val Ala Thr Thr His Ser 290 295 300

Trp Ile Pro Lys Arg Asn Arg Ser Ile Leu Asn Thr Ser Gln Arg Gly 305 310 315

Ile Leu Glu Asp Glu Gln Met Tyr Gln Lys Cys Cys Asn Leu Phe Glu 325 330 335

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<211> 1188

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<213> Equine influenza virus H3N8

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tta aac ctg ggc cag agg aaa tac aca aag acc aca tac tgg tgg gat Leu Asn Leu Gly Gln Arg Lys Tyr Thr Lys Thr Thr Tyr Trp Trp Asp 65 70 75	241										
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		•														
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1241

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<213> Equine influenza virus H3N8

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Gly Met Phe Asn Met Leu Ser Thr Val Leu Gly Val Ser Ile Leu Asn 50 55 60

Leu Gly Gln Arg Lys Tyr Thr Lys Thr Thr Tyr Trp Trp Asp Gly Leu 65 70 75 80

Gln Ser Ser Asp Asp Phe Ala Leu Ile Val Asn Ala Pro Asn His Glu 85 90 95

Gly Ile Gln Ala Gly Val Asp Arg Phe Tyr Arg Thr Cys Lys Leu Val

Gly Ile Asn Met Ser Lys Lys Ser Tyr Ile Asn Arg Thr Gly Thr 115 120 125

Phe Glu Phe Thr Ser Phe Phe Tyr Arg Tyr Gly Phe Val Ala Asn Phe 130 135 140

Ser Met Glu Leu Pro Ser Phe Gly Val Ser Gly Ile Asn Glu Ser Ala 145 150 155 160

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Glu Asp Tyr Lys Gly Arg Leu Cys Asn Pro Leu Asn Pro Phe Val Ser 260 265 270

His Lys Glu Ile Glu Ser Val Asn Ser Ala Val Val Met Pro Ala His 275 280 285

Gly Pro Ala Lys Ser Met Glu Tyr Asp Ala Val Ala Thr Thr His Ser 290 295 300

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Met Val Glu Ala Met Val Ser Arg Ala Arg Ile Asp Ala Arg Ile Asp 355 360 365

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<220>

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Page 107

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- Leu Gly Gln Arg Lys Tyr Thr Lys Thr Thr Tyr Trp Trp Asp Gly Leu 65 70 75 80
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- Gly Ile Gln Ala Gly Val Asp Arg Phe Tyr Arg Thr Cys Lys Leu Val 100 105 110
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- Asp Tyr Arg Tyr Thr Tyr Arg Cys Gln Arg Gly Asp Thr Gln Ile Gln 195 200 205
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- Lys Thr Gly Leu Leu Val Ser Asp Gly Gly Pro Asn Leu Tyr Asn Ile 225 230 235 240
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- Glu Asp Tyr Lys Gly Arg Leu Cys Asn Pro Leu Asn Pro Phe Val Ser 260 265 270
- His Lys Glu Ile Glu Ser Val Asn Ser Ala Val Val Met Pro Ala His 275 280 285
- Gly Pro Ala Lys Ser Met Glu Tyr Asp Ala Val Ala Thr Thr His Ser Page 109

Trp Ile Pro Lys Arg Asn Arg Ser Ile Leu Asn Thr Ser Gln Arg Gly 305 310 315 320

295

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Lys Phe Phe Pro Ser Ser Ser Tyr Arg Arg Pro Val Gly Ile Ser Ser 340 345 350

Met. Val Glu Ala Met Val Ser Arg Ala Arg Ile Asp Ala Arg Ile Asp 355 360 365

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       At amino acid residue 489, Xaa = Thr or Ser
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Leu Lys Val Pro Ala Gln Asn Ala Ile Ser Thr Thr Phe Pro Tyr Thr
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                    15
10
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Page 113

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- Tyr Ser Glu Lys Gly Lys Trp Thr Thr Asn Thr Glu Ile Gly Ala Pro 50 60
- Gln Leu Asn Pro Ile Asp Gly Pro Leu Pro Glu Asp Asn Glu Pro Ser 65 70 75 80
- Gly Tyr Ala Gln Thr Asp Cys Val Leu Glu Ala Met Ala Phe Leu Glu 85 90 95
- Glu Ser His Pro Gly Ile Phe Glu Asn Ser Cys Leu Glu Thr Met Glu 100 105 110
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- Asn Thr Ile Glu Val Phe Arg Ser Asn Asp Leu Thr Ser Ser Glu Ser 145 150 155 160
- Gly Arg Leu Met Asp Phe Leu Lys Asp Val Met Glu Ser Met Asn Lys Page 116

175

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Asn Thr Met Thr Lys Asp Ala Glu Arg Gly Lys Leu Lys Arg Arg Ala 230 235

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Val Gly Gly Asn Glu Lys Lys Ala Lys Leu Ala Asn Val Val Arg Lys 280

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Asp Asn Thr Lys Trp Asn Glu Asn Gln Asn Pro Arg Met Phe Leu Ala 315

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Lys Gly Tyr Met Phe Glu Ser Lys Ser Met Lys Leu Arg Thr Gln Ile 360

Pro Ala Glu Met Leu Ala Ser Ile Asp Leu Lys Tyr Phe Asn Asp Ser 380

Thr Lys Lys Lys Ile Glu Lys Ile Arg Pro Leu Leu Val Asp Gly Thr 400

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Thr	Val	Leu	Gly	Val	Ser	Ile	Leu	Asn	Leu	${ t Gly}$	Gln	Arg	Lys	Tyr	Thr
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Lys Ser Tyr Ile Asn Arg Thr Gly Xaa Phe Glu Phe Thr Ser Phe Phe 485 490 495

Tyr Arg Tyr Gly Phe Val Ala Asn Phe Ser Met Glu Leu Pro Ser Phe 500 505 510

Gly Val Ser Gly Ile Asn Glu Ser Ala Asp Met Ser Ile Gly Met Thr 515 520 525

Val Ile Lys Asn Asn Met Ile Asn Asn Asp Leu Gly Pro Ala Thr Ala 530 540

Gln Met Ala Leu Gln Leu Phe Ile Lys Asp Tyr Arg Tyr Thr Tyr Arg 545 550 555 560

Cys His Arg Gly Asp Thr Gln Ile Gln Thr Arg Arg Ser Phe Glu Leu 565 570 575

Lys Lys Leu Trp Glu Gln Thr Arg Ser Lys Thr Gly Leu Leu Val Ser 580 585 590

Asp Gly Gly Pro Asn Leu Tyr Asn Ile Arg Asn Leu His Ile Pro Glu 595 600 605

Val Cys Leu Lys Trp Glu Leu Met Asp Glu Asp Tyr Lys Gly Arg Leu 610 615 620

Cys Asn Pro Leu Asn Pro Phe Val Ser His Lys Glu Ile Glu Ser Val 625 630 635 640

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aac act gag att gga gca cca caa ctt aat cca atc gat gga ccg ctt Asn Thr Glu Ile Gly Ala Pro Gln Leu Asn Pro Ile Asp Gly Pro Leu 60 65 70	243
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					aac Asn 175											579
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					caa Gln											1155
					gat Asp											1203
					Gly ggg			Ser		Ser	Pro					1251

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	ggc															1	L347
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Tyr Ser Glu Lys Gly Lys Trp Thr Thr Asn Thr Glu Ile Gly Ala Pro

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Gln Leu Asn 65	Pro Ile	Asp Gly 70	Pro	Leu	Pro	Glu 75	Asp	Asn	Glu	Pro	Ser 80
Gly Tyr Ala	Gln Thr 85	Asp Cys	Val	Leu	Glu 90	Ala	Met	Ala	Phe	Leu 95	Glu
Glu Ser His	Pro Gly 100	Ile Phe	: Glu	Asn 105	Ser	Cys	Leu	Glu	Thr 110	Met	Glu
Val Val Gln 115	Gln Thr	Arg Val	. Asp 120	Lys	Leu	Thr	Gln	Gly 125	Arg	Gln	Thr
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Glu Glu Met	Glu Ile 180	Thr Thi	His	Phe 185	Gln	Arg	Lys	Arg	Arg 190	Val	Arg
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Lys Gln Arg 210	Leu Asn	Arg Lys 21		Tyr	Leu	Ile	Arg 220	Ala	Leu	Thr	Leu
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Ile Ala Thr	Pro Gly 245		n Ile	Arg	Gly 250	Phe	Val	Tyr	Phe	Val 255	Glu
Thr Leu Ala	Arg Arg 260	Ile Cy	s Glu	Lys 265	Leu	Glu	Gln	Ser	Gly 270	Leu	Pro
Val Gly Gly 275	Asn Glu	Lys Ly	3 Ala 280	Lys	Leu	Ala	Asn	Val 285	Val	Arg	Lys

Met Me	et Th	ır Asn	Ser	Gln	Asp	Thr	Glu	Leu	Ser	Phe	Thr	Ile	Thr	Gly
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Met Ile Thr Tyr Ile Thr Arg Asn Gln Pro Glu Trp Phe Arg Asn Val 325 330 335

Leu Ser Ile Ala Pro Ile Met Phe Ser Asn Lys Met Ala Arg Leu Gly 340 345 350

Lys Gly Tyr Met Phe Glu Ser Lys Ser Met Lys Leu Arg Thr Gln Ile 355 360 365

Pro Ala Glu Met Leu Ala Ser Ile Asp Leu Lys Tyr Phe Asn Asp Ser 370 375 380

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Ala Ser Leu Ser Pro Gly Met Met Met Gly Met Phe Asn Met Leu Ser 405 410 415

Thr Val Leu Gly Val Ser Ile Leu Asn Leu Gly Gln Arg Lys Tyr Thr 420 425 430

Lys Thr Thr Tyr Trp Trp Asp Gly Leu Gln Ser Ser Asp Asp Phe Ala 435 440 445

Leu Ile Val Asn Ala Pro Asn His Glu Gly Ile Gln Ala Gly Val Asp 450 455 460

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Lys Ser Tyr Ile Asn Arg Thr Gly Thr Phe Glu Phe Thr Ser Phe Phe 485 490 495

Tyr Arg Tyr Gly Phe Val Ala Asn Phe Ser Met Glu Leu Pro Ser Phe 500 505 510

Gly Val Ser Gly Ile Asn Glu Ser Ala Asp Met Ser Ile Gly Met Thr 515 520 525

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Gln 545	Met	Ala	Leu	Gln	Leu 550	Phe	Ile	Lys	Asp	Tyr 555	Arg	Tyr	Thr	Tyr	Arg 560
Cys	Gln	Arg	Gly	Asp 565	Thr	Gln	Ile	Gln	Thr 570	Arg	Arg	Ser	Phe	Glu 575	Leu
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Cys 625	Asn	Pro	Leu	Asn	Pro 630	Phe	Val	Ser	His	Lys 635	Glu	Ile	Glu	Ser	Val 640
Asn	Ser	Ala	Val	Val 645	Met	Pro	Ala	His	Gly 650	Pro	Ala	Lys	Ser	Met 655	Glu
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Ser	Ile	Leu 675	Asn	Thr	Ser	Gln	Arg 680	Gly	Ile	Leu	Glu	Asp 685	Glu	Gln	Met
Tyr	Gln 690	Lys	Cys	Cys	Asn	Leu 695	Phe	Glu	Lys	Phe	Phe 700	Pro	Ser	Ser	Ser
Tyr 705		Xaa	Pro	Val	Gly 710	Ile	Ser	Ser	Met	Val 715	Glu	Ala	Met	Val	Ser 720
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Lys	. ^{Asp}	Glu	Phe 740		Glu	Ile	Met	Lys 745		Cys	Ser	Thr	Ile 750	Glu	Glu
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